The California Software Industry

Software is a $300 billion global industry that is constantly changing the way people and businesses perform everyday tasks. Software can be found in everything ranging from ATMs to three-dimensional imagery equipment used for medical diagnoses. Its widespread and growing use has made it one of the most dynamic and promising industries in the world.

The software industry began in the U.S. during the mid-1960s when the federal government started investing in basic software research. International Business Machines (IBM) dominated the computer business with little or no competition. IBM developed comprehensive mainframe systems using proprietary software and hardware, which prevented other companies from competing with them. However, in 1968, the U.S. Justice Department forced IBM to price its software and hardware separately, opening the door for competition in the computer software market.

Since that time, California has emerged as the world leader in the software industry. With its long history of technology, and a highly educated and creative workforce, the state has become center of innovation and market responsiveness for the industry. The success of the California software industry continues to propel itself, creating new niches for spin-off and start-up companies, and attracting venture capital in record amounts.

Definition of the Software Industry

Computer software is the written or printed data, such as programs, routines, and symbolic languages that operate and maintain computers and other hardware peripherals. In contrast to firmware or microcode, which are also programmed but are loaded on a one-time or infrequent basis so that thereafter it seems to be part of the hardware. Software is the intellectual creation that is independent from the computer on which it was recorded.

Currently, under the 1987 Standard Industrial Classification (SIC) system, the software industry is composed of establishments operating within computer programming, prepackaged software, and computer integrated systems design segments. However, as federal agencies convert to the new North American Industry Classification System (NAICS), the software industry will be defined under the four NAICS industries of: custom computer programming services, software publishing, software reproducing, and computer systems design services. (See last page for SIC-NAICS cross over.)

Characteristics of the Industry

Companies. The software industry includes businesses ranging from small web-page designers to giant prepackaged-software corporations. Companies like Microsoft, Computer Associates, IBM, Novell, and Oracle dominate the industry. The top 25 percent of companies by sales are responsible for the overwhelming majority of sales and employment in the industry. However, the majority of computer software companies are small businesses with fewer than 10 employees.

Costs/Revenues. Software companies generate revenues through the licensing of software products, custom/contract programming, and consultative and support services. However, these companies usually experience significant upfront costs for development, marketing, and technical support infrastructure on initial versions of software products. As subsequent versions of software are produced, these costs drop substantially since newer versions are based on the same technical development.

Gross profit margins in the software business are often 70 to 80 percent of sales because there is very little in expenses needed to support a software company. The largest expense to software companies is the cost of labor, with industry wages among the highest of all industries in the U.S. These high wages reflect the importance of human capital to the development of software, as well as the current shortage of skilled workers in the industry.

The Software Development Process. These companies develop software through a long labor-intensive process. This process begins with the development of an algorithm or "blueprint" of the program, often in the form of a flowchart or pseudocode. Next, the programmer uses a programming language to code the algorithm into an executable program. This stage is usually the most time consuming and costly. After an executable program has been created, it goes through a thorough testing and debugging stage to ensure that it is operating properly. Finally, the end product is "ported" to operate on various platforms. (A *platform* is the operating system environment in which a program runs.)

Types of Software. Software is created for every type of platform, from the smallest personal digital assistants (PDAs), up to network servers, mainframes, and the very largest supercomputers. Computer software can be classified into three main functional categories: systems software, application software, and middleware.

Systems software includes operating systems and utility programs that control, manage, and monitor computer resources. Utilities software includes compilers, interpreters and other utilities that perform support tasks for operating systems and applications.

Application software includes prepackaged and custom software. Prepackaged software applications are generic, widely-used programs such as word processors, spreadsheets, and database applications, that are produced in mass quantities to meet the needs of a wide variety of users. Custom software applications are programs tailored to the particular needs of a specific user or organization that cannot be met by prepackaged software. For example, custom banking software tracks deposit and withdrawal transactions, as well as transfers funds across town and the nation.

Middleware is software that connects two otherwise separate applications. Middleware is sometimes called *plumbing* because it connects two sides of an application and passes data between them. For example, there are a number of middleware products that link databases to Web servers, allowing users to request data from the database using forms displayed on a Web browser.

Market Segments. The software industry creates a wide variety of software products for the home, education, entertainment , and business markets. The home software market consists of home productivity, education and entertainment applications. The education market includes educational software for K-12, as well as applications that assist institutions of higher learning in research, analysis, and commercial applications designed to prepare students for the workplace.

The entertainment segment ranges from the simplest computer games to the most realistic computer generated graphics for motion picture special effects. The combination of computer software and graphic design has spawned whole new niche markets in multimedia.

The business market is the largest and most diverse segment of the software market. Virtually all businesses use general business and industry-specific software to maintain their competitive edge. Some of the California products catering to this segment include:

- *Database Management Systems (DBMS)* –programs that store, modify, and extract information from a database.
- *Internet and Multimedia Software* – applications to view web pages (browsers), create web pages (web design software), and search the Internet (search engines).
- *Desktop Publishing* – applications to create electronic documents for printing or publishing on the Internet.
- *Networking and Utility Software* – applications that facilitate communications, perform maintenance, and manage resources over a computer network.
- *Computer-Aided Systems* - computer systems that create precision drawings or technical illustrations (Computer Aided Design); analyze and simulate designs under a variety of conditions (Computer Aided Engineering); and automate factory operations, such as directing the manufacture and inventory of parts (Computer Aided Manufacturing).
- *Programming languages* - High-level languages with their own unique set of keywords (words that it understands) and special syntax for organizing program instructions.

Exports. Although there are no official trade statistics on software, the American Alliance for Software Exports estimated U.S. software exports to reach $160 billion by the end of 2000. The industry has consistently generated an increasing annual trade surplus, reaching $13 billion in 1997. This surplus is expected to exceed $20 billion by the end of 2000. The global software market is projected to grow at 15 percent annually through 2003, with the fastest growth occurring in Asian and the Middle Eastern/ African regions of the world.

California: The Software Leader

California is by far the leading software state in the nation. In 1997, the software industry in the state had receipts totaling $33 billion, equaling 20 percent of the U.S. industry. In 1998, California employment in the industry was approximately 150,000 people with annual payroll of more than $12 billion. Average annual wages for the industry totaled $82,000, more than twice the state average for all industries.

Custom programming services was the largest segment, in terms of jobs in California's Software industry. This segment employed 45 percent of the industry with average annual wages of $74,000. The slightly smaller prepackaged software segment employed 36 percent of the industry, with average annual wages of $89,000. Industry wages have been rising significantly faster than most other industries in the state and nation because of a shortage of skilled workers. As a result, in 1995, San Jose moved ahead of New York as the highest average-pay city in the nation.

There were nearly 9,000 software businesses in the state in 1998, plus many more sole proprietors. Almost half of these businesses are centered around the San Francisco Bay Area. The region is dominated by large software companies located along the South Bay counties of Alameda, Santa Clara, and San Mateo. Santa Clara County, also know as Silicon Valley, is the largest software county in the state with 30 percent of industry employment. More than 1,700 software businesses are located in this county, employing more than 43,000 people. The industry's explosive growth in this region has led to a bidding war for skilled labor, resulting in average annual wages as high as $97,000 in 1998.
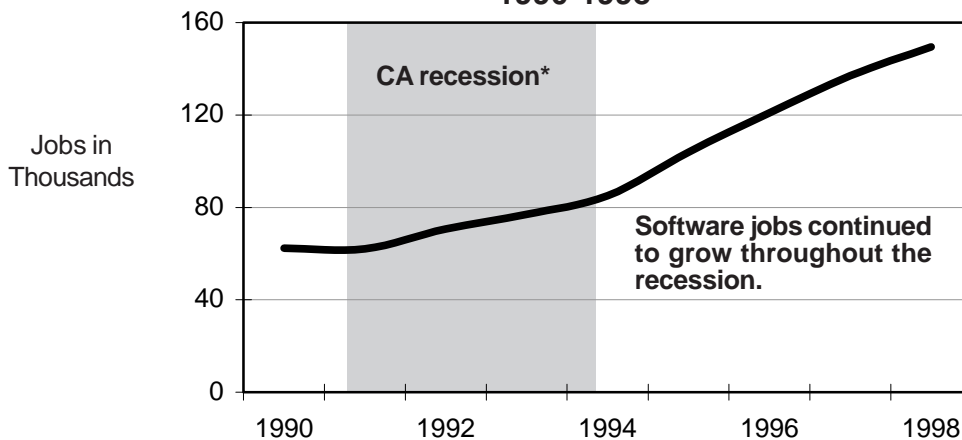
California Software Industry, 1998
Largest Counties by Employment

- Other Counties 28%
- Santa Clara 30%
- San Francisco 4%
- Alameda 8%
- San Diego 7%
- Orange 9%
- Los Angeles 14%
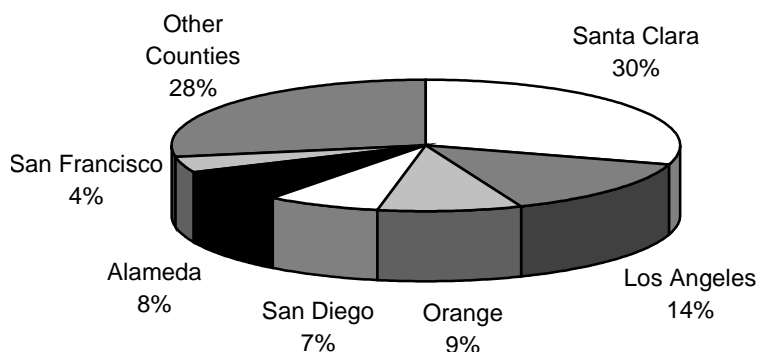
Southern California's software industry is slightly smaller than in the San Francisco Bay Area. Los Angeles was the largest software county in this region, and second largest in the state. Los Angeles has 14 percent of industry employment, with 1,400 businesses employing 21,000 people. Other counties with a significant industry presence include Orange County and San Diego County. Average annual wages in the Southern California region ranged from $64,000 to $75,000 in 1998.

A Driving Force in the California Economy. The software industry plays a vital role in the state economy. It is one of the fastest growing and highest paying industries in the state. From 1993 to 1998, software jobs grew at an average annual rate of almost 14 percent, helping to lead the state out of recession. During this time, the industry payroll grew at an average annual rate of 22 percent and added more than 72,000 jobs to the economy.

California Software Industry Employment
1990-1998

Jobs in Thousands

CA recession*

Software jobs continued to grow throughout the recession.

* Note: California recession, in terms of net job loss, began during the first quarter of 1991 and ended during the first quarter of 1994.

Growth in the California software industry came at a critical time for the state. During the early 1990s, the state's aerospace and defense industry was losing thousands of jobs from defense cuts. The software industry was able to absorb some of these occupations and offset the lost income to the state with equally high paying positions.

The software industry is also contributing to other industries in the state by providing the tools to boost productivity and international competitiveness. As a result, the state has developed a stronger and more diverse economic base. For example, advances in the use of software have contributed to the development of the new, fast-growing industries of multimedia, the Internet, and biotechnology. In turn, these industries are generating jobs and income, and attracting venture capital to the state in record amounts. In 1999, California companies received 47 percent of all venture capital in the U.S. with the greatest share going to the software industry.

The software industry is also benefiting traditional industries such as banking, telecommunications, and manufacturing, by allowing them to incorporate new technology, such as the Internet, into everyday operations and stay competitive into the next century. The result has been a modern, growing, and diversified economic base for California.

California Industry Leaders. California software companies have a strong presence in almost every segment of the industry. The home software market is especially strong in California, with more household computers than any other state, and a population that eagerly embraces technology. However, the California software industry is best known for the products they create for the businesses.

California is home to some of the top software companies in the world specializing in business software. According to *Software Magazine*, California has five of the top ten software companies in the U.S., including Oracle—the third largest software company in the U.S. Listed below are the ten largest California software companies, their specific areas of expertise, and California location:

Top Ten California Companies by Software Revenues, 1998

1. *Oracle Corporation*
Databases / Enterprise Resource Planning
Redwood Shores, CA

2. *Hitachi Ltd.*
Enterprise Application Integration
Brisbane, CA

3. *Hewlett Packard*
Network/Systems Management /
Operating Systems
Palo Alto, CA

4. *Sun Microsystems*
Operating Systems / Dev. Tools / Languages /
Network/Systems Management
Palo Alto, CA

5. *PeopleSoft, Inc.*
Enterprise Resource Planning/
Enterprise Application Suites
Pleasanton, CA

6. *Network Associates, Inc.*
Network/Systems Management
Santa Clara, CA

7. *Cadence Design Systems, Inc.*
Engineering Productivity
San Jose, CA

8. *Adobe Systems Incorporated*
Desktop publishing software / Graphics
San Jose, CA

9. *Sybase, Inc.*
Middleware / Databases /
Enterprise Application Integration
Emeryville, CA

10. *Synopsys, Inc.*
EDA/CAD/CAM
Mountain View, CA

Industry Challenges

The rapid pace of change and expansion of the computer software industry has also created problems for the industry worldwide. The industry is facing a shortage of skilled workers to meet its growing and changing needs. Colleges and universities are the primary source of labor for the software industry. As the industry grows, increasing numbers of students enroll in computer science programs. However, the time required to complete these programs is generally 3 to 5 years. As a result, graduation patterns tend to lag marketplace demands. This problem is especially significant to the software industry, where technology and market demand for skills and labor can change drastically in a short amount of time. The current labor shortage stems from an industry slowdown during the late 1980s, and the recent unprecedented growth in demand for software skills from the Internet, multimedia, and network computing.

Another significant problem facing the industry is software piracy. Software piracy is the unauthorized copying of computer software for either commercial or personal use. As software programmers and publishers produce new products each year, the protection of intellectual property rights has lagged. Software piracy is committed through software counterfeiting, loading software onto more than one computer, or downloading from the Internet or other telecommunications networks without payment or permission. Based on an independent survey conducted by the Business Software Alliance (BSA) and the Software Publishers Association (SPA), worldwide software piracy cost U.S. business more than $11 billion in 1997. Most of the piracy is occurring in other countries as increasing amounts of U.S. software are shipped to foreign markets. Regions with the highest software piracy rates include Eastern Europe, the Middle East/Africa, and Latin America.

SIC Code	NAICS Code
Computer programming services (SIC 7371) - Establishments that provide computer programming services, software design and analysis; modifications to custom software; and training in the use of custom software on a contract or fee basis.	**Custom Computer Programming Services (NAICS 541511)** – Establishments engaged in the writing, modifying, testing, and supporting of software to meet the needs of a particular customer.
Prepackaged software (SIC 7372) - Establishments engaged in the design, development, and production of prepackaged software, preparation of software documentation, installation, and training.	**Software Publishers (NAICS 51121)** – Establishments engaged in computer software publishing or publishing and reproduction. These businesses carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. They may design, develop, and publish, or publish only. **Software Reproducing (NAICS 334611)** – Establishments engaged in the mass reproducing of computer software. They generally do not develop any software; they mass reproduce data and programs, such as CD-ROMs and game cartridges, on magnetic media, such as diskettes, tapes, or cartridges.
Computer integrated systems design (SIC 7373) - Establishments engaged in the development or modification of computer software and packaging or building the software with purchased computer hardware to create and market an integrated system for specific applications.	**Computer Systems Design Services (NAICS 541512)** - Establishments engaged in the planning and designing of computer systems that integrate computer hardware, software, and communication technologies. These establishments often install the system and train and support users of the system.